Candida auris: An emerging threat

Dr. Victor Leung, MD FRCPC
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Conflicts of Interest

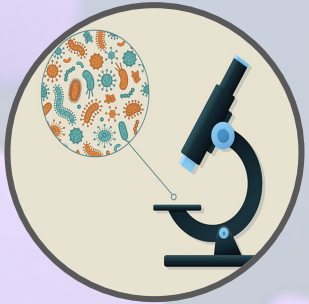
Advisory board: Merck, Pfizer, Paladin, Astra-Zeneca, GSK

Speaker Honorarium: Merck, Pfizer, Biomerieux, Diversey

Outline

Origins and Spread

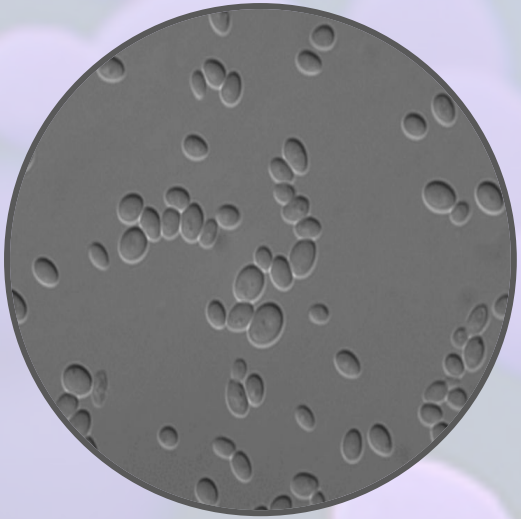
Surveillance and Outbreaks

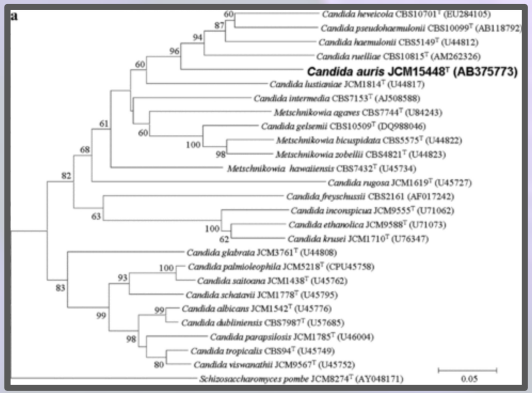


Diagnostics

Therapeutics

Origins and Spread

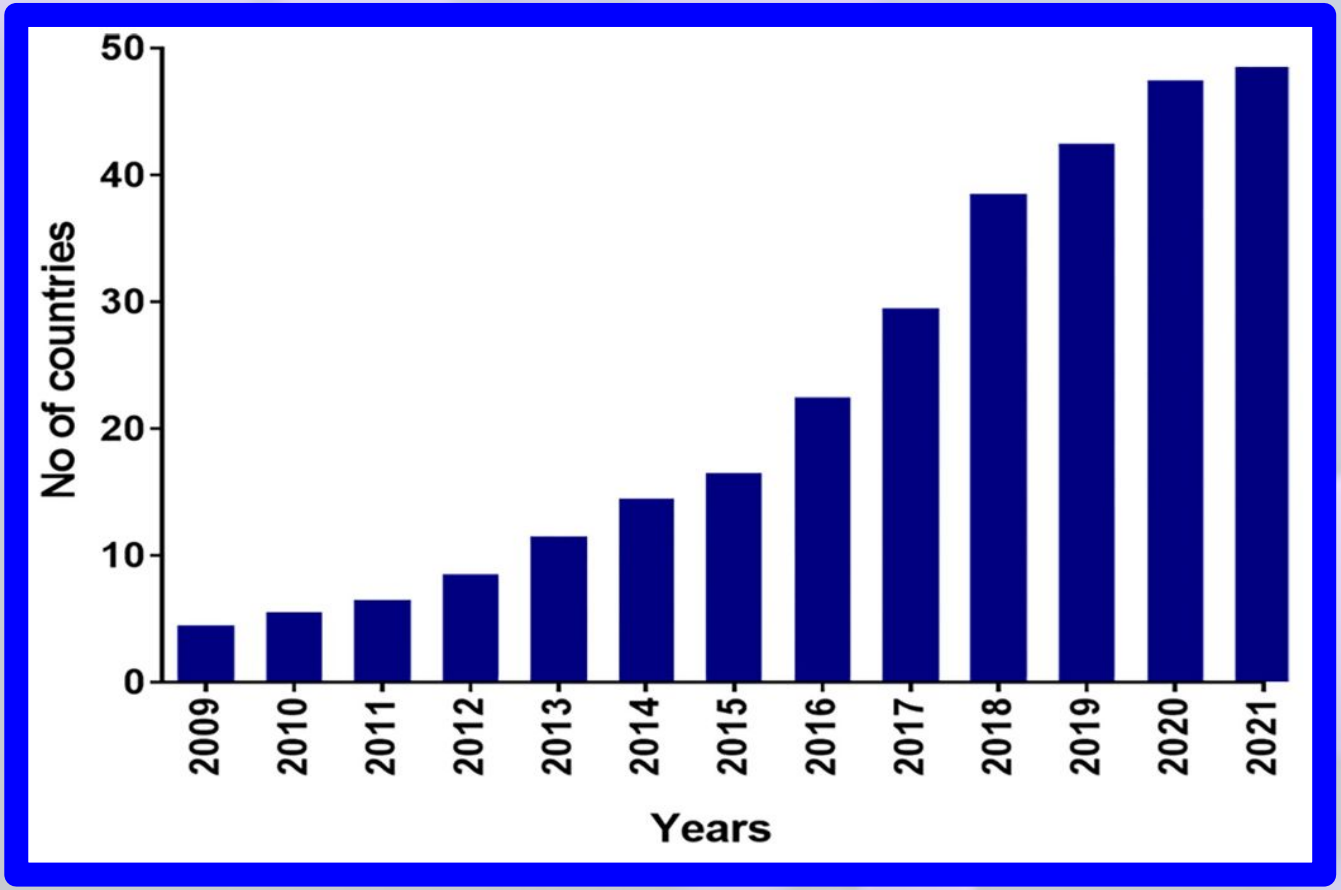




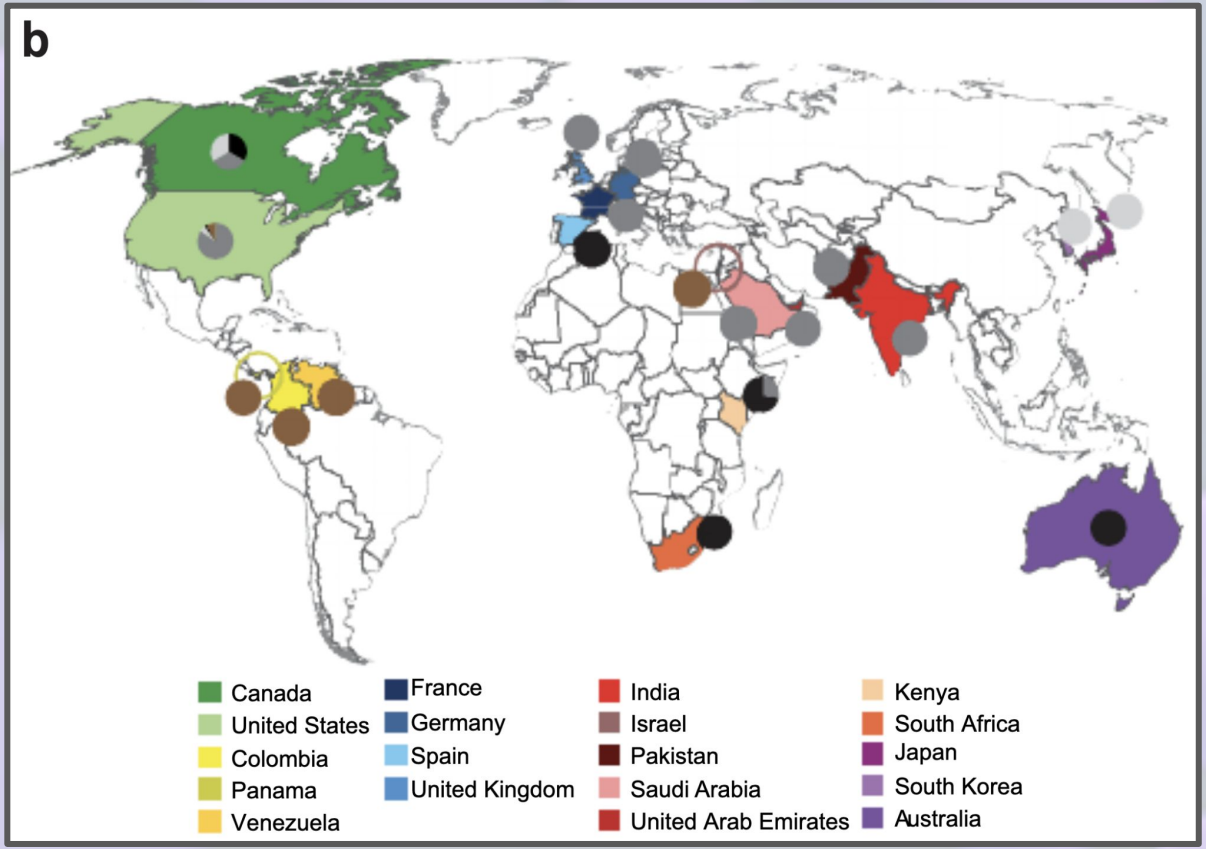
- Isolated from ear canal of 70 year old female in Tokyo in 2009
- Retrospective analysis of clinical isolates identified *C. auris* in Korea (1996 blood isolate) and in Pakistan in 2008
- SENTRY Antifungal Surveillance (1998-2016) only identified 6 isolates of C. auris out of 20758 Candida isolates

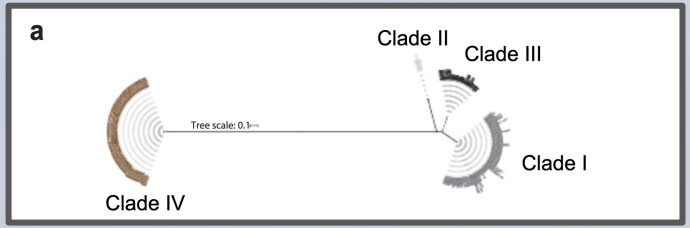
Satoh et al., Microbiology and Immunology 2009. Vol 53 (1)

Cumulative number of countries with reported detection of *Candida auris*



Near Simultaneous Emergence of Distinct Clades of *C. auris*



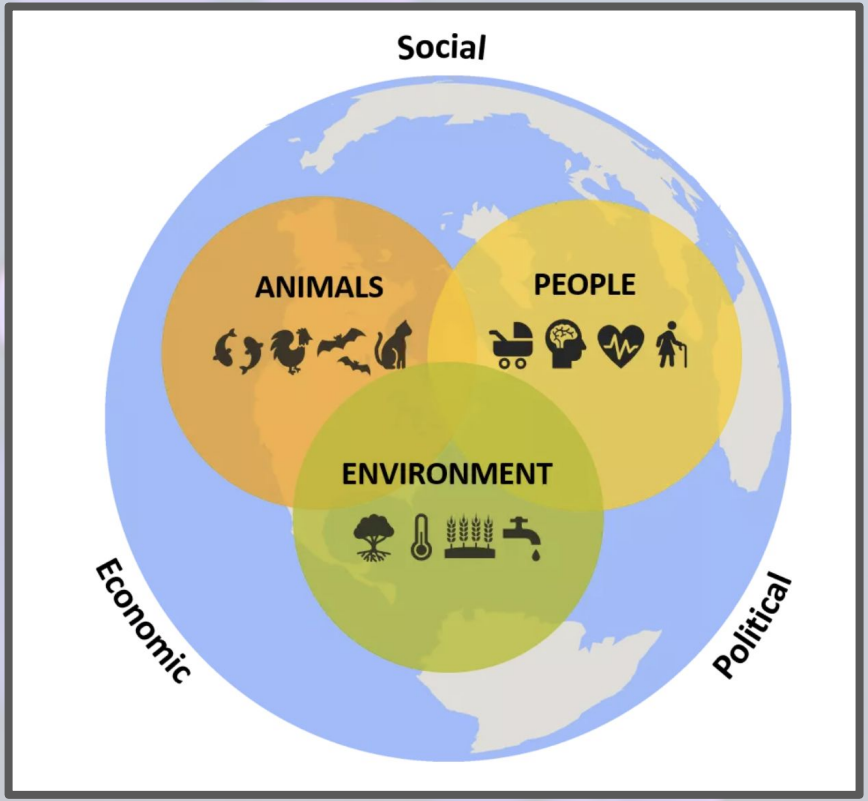


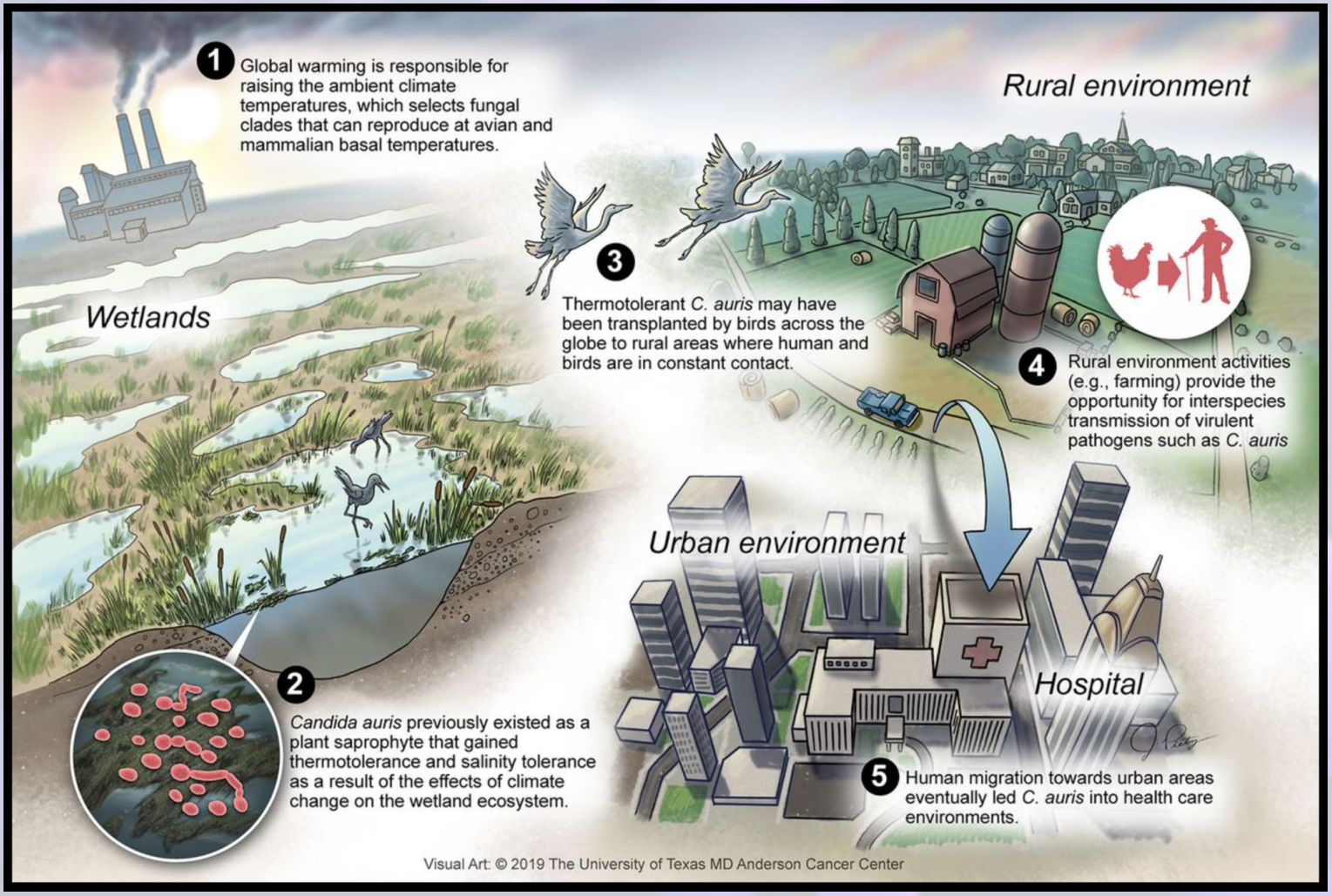
Clade I - South Asian
Clade II - East Asian
Clade III - South African
Clade IV - South American
Clade V - Iran

40-200K SNP difference between clades
2-600 SNP differences within clades

Chow et al. MBio. 2020; 11(2)

One Health

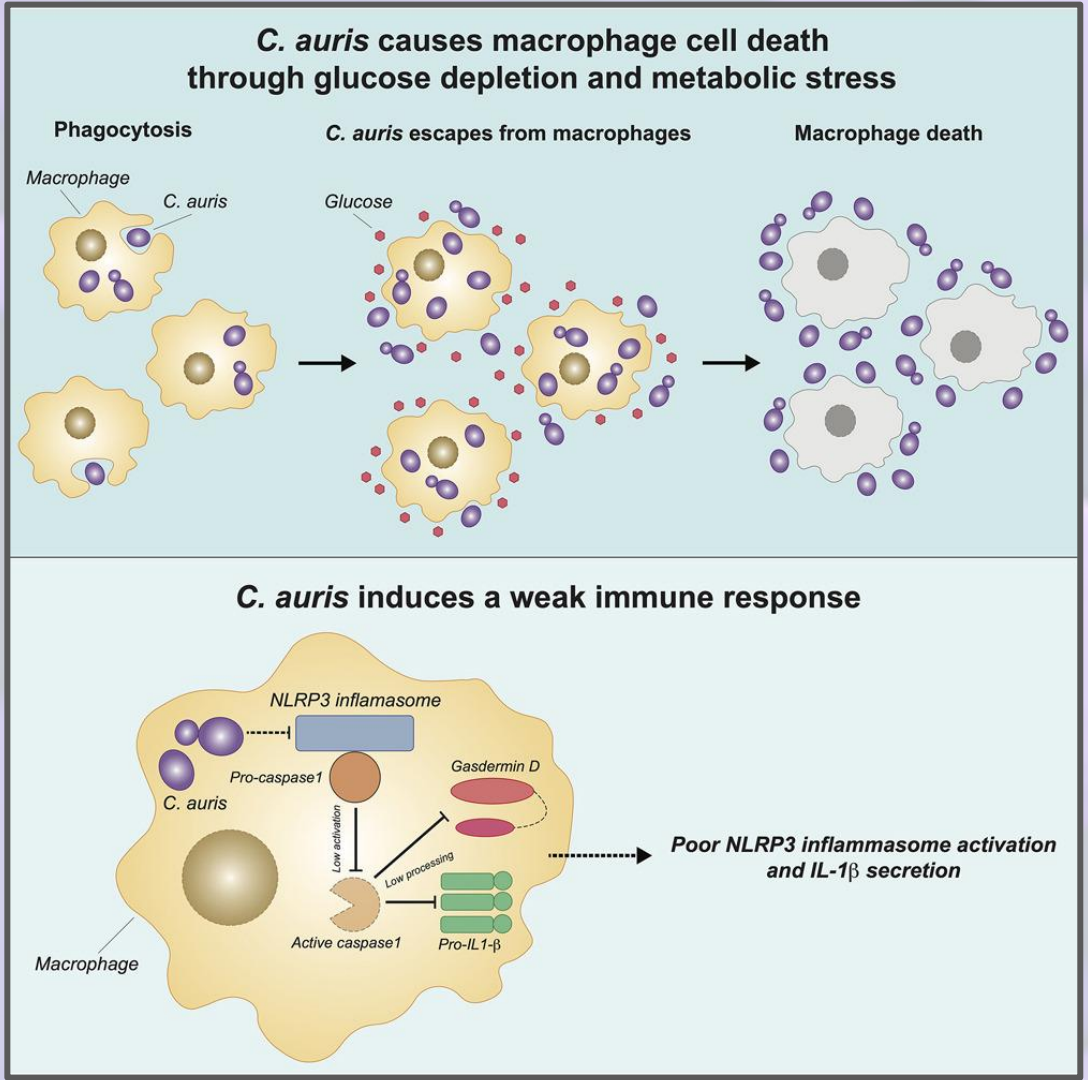




Casadevall *et al.* Mbio. Vol 10, No 4, 2019

WHO - Priority Fungal Pathogens

- Public health threat from fungi is increasing
- Opportunistic infection are becoming increasingly resistant to firstline antifungals



C. auris is phagocytosed by macrophages during innate immune responses.

C. auris evades macrophages by escaping and depleting glucose, which triggers macrophage cell death.

Despite causing macrophage metabolic dysfunction and death, C. auris does not activate robust NLRP3- inflammasome responses, thereby evading antimicrobial inflammation.

Weerasinghe et al. Cell Reports. Vol 42. Issue 5. 2023

Surveillance and Outbreaks

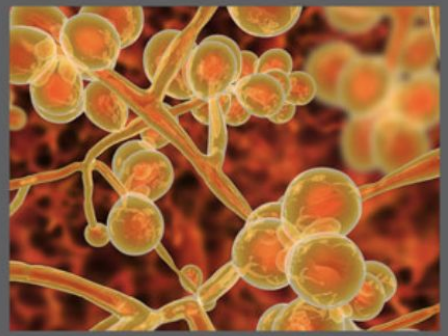
Canada Communicable Disease Report
CCDR
VISUAL ABSTRACT

CANDIDA AURIS
WHAT HEALTH CARE PROVIDERS NEED TO KNOW

C. auris is an emerging multidrug resistant fungus

It is now in Canada

- can cause invasive disease
- is difficult to detect
- can spread easily in health care environments



Who is at risk?

Those who don't respond to antifungal therapy and have a history of:

- travel-associated healthcare
- a lab result with unidentified/ unusual candida species
- a central venous line
- abdominal surgery
- exposure to broad-spectrum antibiotics or antifungals

Best Practices

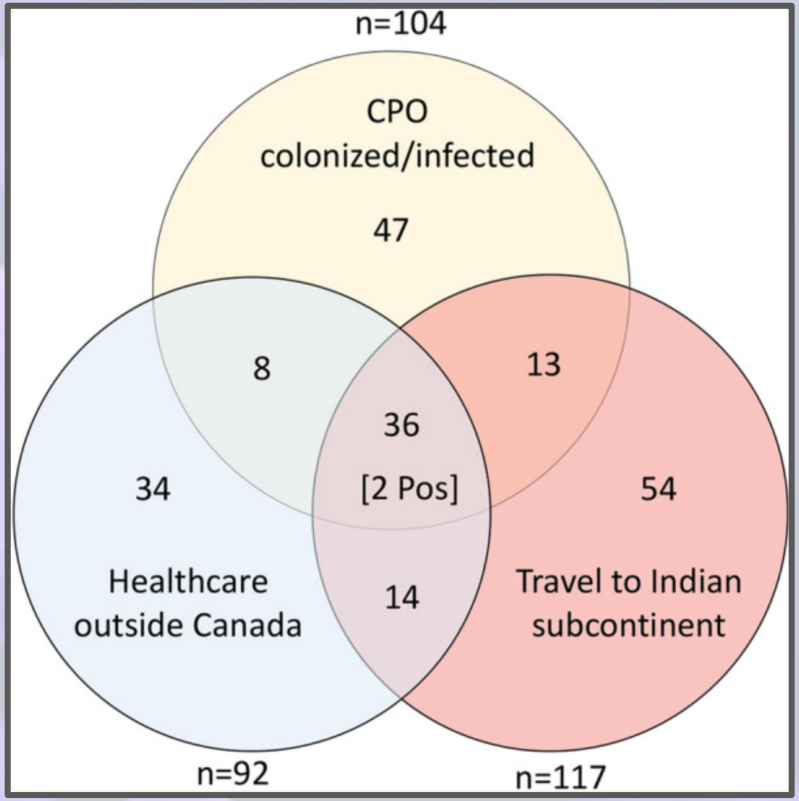
Transfer the patient to a private room and consult:

- infectious disease specialist
- infection prevention and control
- public health

Reference: Schwartz IS, Smith SW, Dingle TC. Something wicked this way comes: What health care providers need to know about *Candida auris*. Can Commun Dis Rep 2018;44(11):271-6. https://doi.org/10.14745/ccdr.v44i11a01

Candida auris in Canada

- First reported case of *C. auris* in Canada was in 2017 in a returned traveler from India.
- First 2 reported cases in Canada received health care in India (both cases colonized/infected with CPE)
- Point prevalence study in Canada in 2018 with 23 acute care hospitals in 6 provinces (CNISP/CHEC): 0.4% (2/488)
  - No hospital contacts were identified



1) Schwartz *et al.* CCDR 2017
2) Eckbo *et al.* http://www.promedmail.org/direct.php?id=20170923.5335411
3) Garcia Jeldes et al. Antimicrob Resist Infect Control. 2020; 9: 82

Candida auris Surveillance in Canada

- Canadian Nosocomial Infection Surveillance Program - January 2020 Protocol
- 43 known cases in Canada since 2012
- First reported outbreak in Canada at VCH hospital ICU in 2018 (Clade 1)
- British Columbia, September 2018: *C auris* added to the list of reportable pathogens to Public Health

Notice: Candida auris interim recommendations for infection prevention and control

Emerging global healthcare-associated fungal pathogen *Candida auris* (*C. auris*)

Eckbo *et al.* Am J Infect Control 2021 Jun;49(6):804-807.

Original Research | April 2023

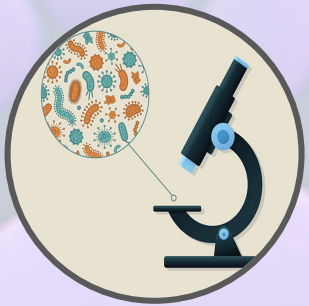
Worsening Spread of *Candida auris* in the United States, 2019 to 2021

Meghan Lyman, MD, Kaitlin Forsberg, MPH, D. Joseph Sexton, PhD, Nancy A. Chow, PhD, MS, Shawn R. Lockhart, PhD, Brendan R. Jackson, MD, MPH, and Tom Chiller, MD, MPHTM View fewer authors

Percentage increase in clinical cases grew each year, from a 44 percent increase in 2019 to a 95 percent increase in 2021.

They also report that colonization screening volume and screening cases increased in 2021 by more than 80 percent and more than 200 percent, respectively.

The number of *C auris* cases that were resistant to first-line treatment in 2021 was about 3 times that in each of the previous 2 years.

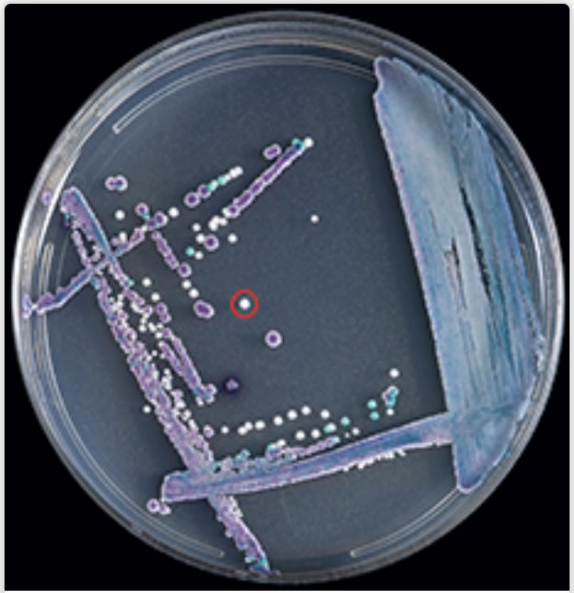


Diagnostics

Misidentification of *C. auris* by different diagnostic methods

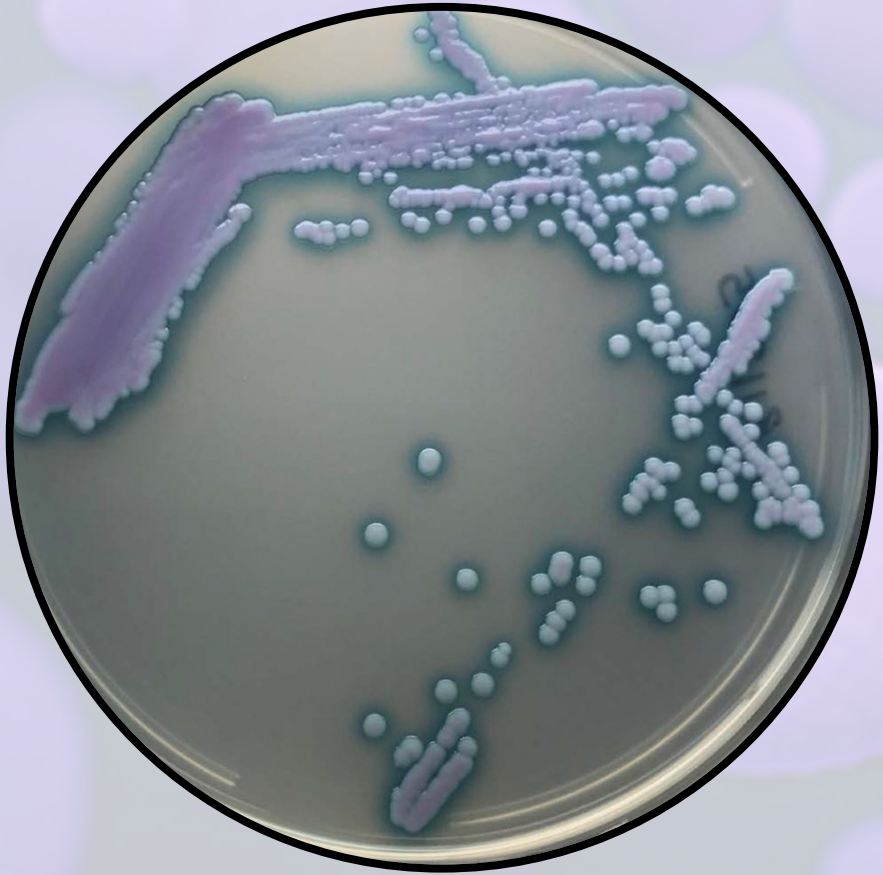
Diagnostic method (manufacturer)	Misidentification example(s) (reference[s])
Biochemical	
API 20CAUX	*Rhodotorula glutinis* (5, 31, 33)
	C. sake (3, 15, 34)
	Unidentified (35)
API Candida	*C. famata* (12)
Phoenix (BD Diagnostics)	*C. haemulonii*, *C catenulate* (31)
Vitek	*C. haemulonii* (3–5, 7, 12, 14, 15, 26, 27, 33–36)
	C. lusitaniae (15)
	C. famata (3, 27)
MicroScan (Beckman Coulter)	*C. famata*, *C. lusitaniae*, *C. guilliermondii*, *C. parapsilosis*, *C. albicans*, *C. tropicalis* (12, 31)
MALDI-TOF MS	
Vitek MS (bioMérieux)	*C. albicans*, *C. haemulonii* (29)
	Not identified (28, 36)
MALDI Biotyper (Bruker Daltonics)	*Neisseria meningitides* serogroup A, *Pseudomonas rhizosphaerae* (29)[a]

Jeffrey-Smith et al. CMR. 2017 Vol 31(1)



For example, this is a mixed culture of *Candida glabrata* (purple), *Candida tropicalis* (navy blue), and *Candida auris* (white, circled in red) on CHROMagar Candida.

Candida auris on CHROMagar Candida, here, for example, displays multiple color morphs.



CHROMAgar Candida Plus

- *Candida auris* after 48 h of growth showing light blue colonies with a blue halo around the colonies.
- The combination of the color and the halo are distinct for *C. auris*

BioFire FilmArray Blood Culture Identification 2 (BCID2) Panel

Gram-negative Bacteria

Acinetobacter calcoaceticus-baumannii complex
Bacteroides fragilis
Enteric Bacteria
- *Enterobacter cloacae* complex
- *Escherichia coli*
- *Klebsiella aerogenes*
- *Klebsiella oxytoca*
- *Klebsiella pneumoniae* group
- *Proteus* spp.
- *Salmonella* spp.
- *Serratia marcescens*

Haemophilus influenzae
Neisseria meningitidis
Pseudomonas aeruginosa
Stenotrophomonas maltophilia

Yeast

Candida albicans
Candida auris
Candida glabrata
Candida krusei
Candida parapsilosis
Candida tropicalis
Cryptococcus neoformans/gattii

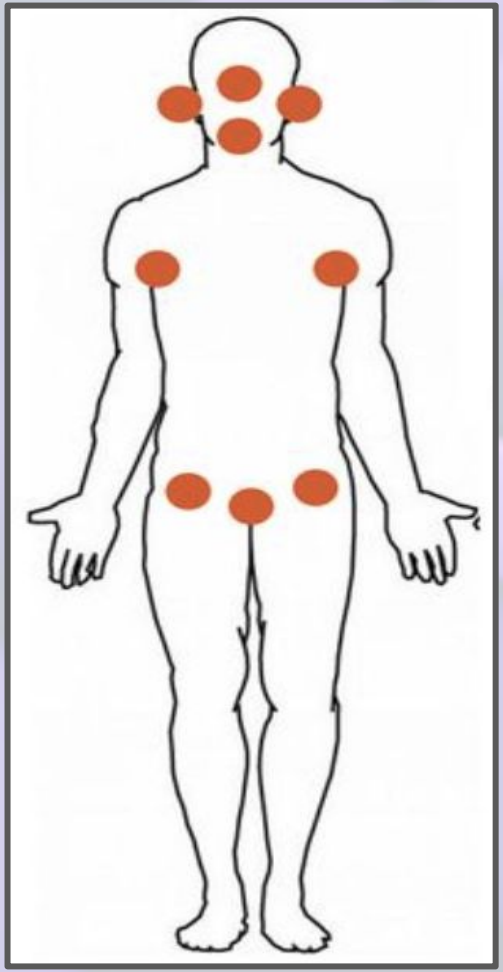
Gram-positive Bacteria

Enterococcus faecalis
Enterococcus faecium
Listeria monocytogenes
Staphylococcus spp.
- *Staphylococcus aureus*
- *Staphylococcus epidermidis*
- *Staphylococcus lugdunensis*

Streptococcus spp.
- *Streptococcus agalactiae* (Group B)
- *Streptococcus pneumoniae*
- *Streptococcus pyogenes* (Group A)

Antimicrobial Resistance Genes

bla_{CTX-M}
bla_{IMP}
bla_{KPC}
mcr-1
*mec*A/C and MREJ
bla_{NDM}
$bla_{OXA-48-like}$
bla_{VIM}
*van*A/B



Surveillance Cultures

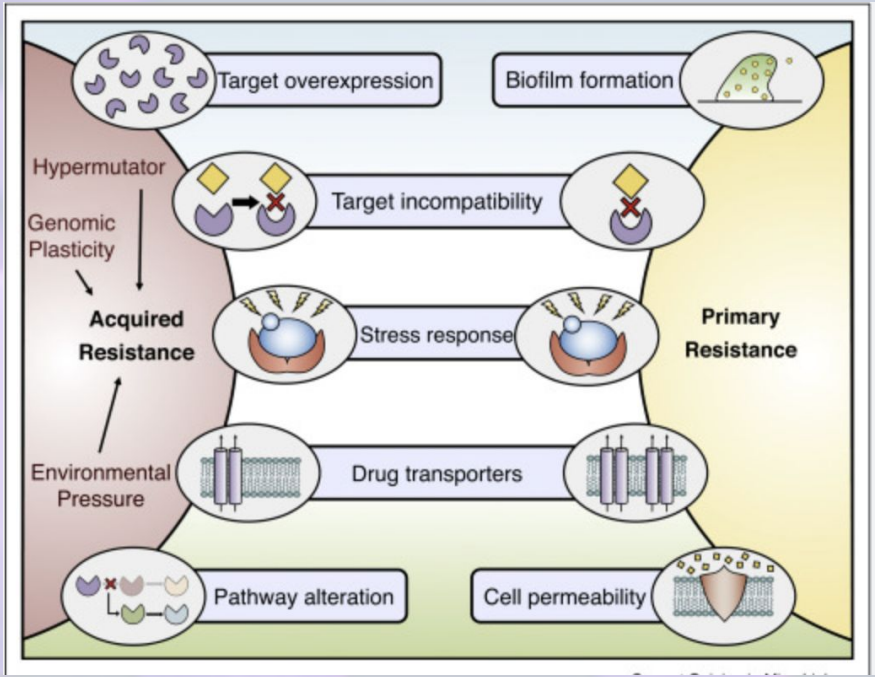
Axilla
Groin
Nares, Ears
Wounds, Lines, Drains

Therapeutics

Limited Therapeutic Options

- 90% of isolates resistant to one antifungal
- 30% of isolates resistant to two antifungals

Azoles
Echinocandins
Polyenes



List P: Antimicrobial Products Registered with EPA for Claims Against Candida Auris

Sodium hypochlorite
Hydrogen peroxide
Hydrogen peroxide + Paracetic Acid
Dodecylbenzenesulfonic Acid
Isopropyl Alcohol + Quaternary Ammonium

Summary

- Rapid global emergence
- Often multi-drug resistant
- Often misidentified
- Crude mortality ~ 30-60%
- Highly transmissible between patients and environment
- Nosocomial infections/outbreaks